MBA(D) (3rd Semester) Examinations, Dec 2018 (CDOE)
[Sessions: (Jul 2016-Jun 2018), (Jul 2017-Jun 2019)]

Subject: Operations Research
Paper: MBD-301

Time: 3 Hours   **Full Marks: 80**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own
words as far as practicable.

Group - A

Answer any six questions.   **5×6=30**

1. What do you understand by linear programming (LP)? What is an infeasible solution and how does it occur?

2. What is degeneracy in transportation problems? How is a transportation problem solved when demand and supply are not equal?

3. Given a transportation problem with the following costs, supply, and demand, find the total cost of transportation by Vogel's Approximation Method (VAM):

To (Cost) / From	L1	L2	L3	Supply
A	6	7	4	12
B	5	3	6	17
C	8	5	7	11
Demand	13	17	7	

4. Construct the dual to the following primal problem:

Maximize $Z = 3x_1 + 5x_2$

Subject to

$2x_1 + 6x_2 \leq 50$

$3x_1 + 2x_2 \leq 35$

$5x_1 - 3x_2 \leq 10$

$x_1 \leq 20$

$x_1, x_2 \geq 0$

5. Make a Comparison between the assignment model and the transportation model.

6. What do you mean by 'Unbalanced Assignment Problems'? How do you solve such problems?

7. Elucidate total, independent and free floats in the context of network analysis.

8. Briefly discuss the theory of dominance in the solution of rectangular games.

Please Turn Over

Group -B

Answer any five questions.   **10×5=50**

9. A firm plans to purchase at least 200 quintals of scrap containing high-quality metal –X and low-quality Metal -Y. It decides that the scrap to be purchased must contain at least 100 quintals of X-metal and not more than 35 quintals of Y-metal. The firm can purchase the scrap from two suppliers (A and B) in unlimited quantities. The percentage of X and Y metals in terms of weight in the scrap supplied by A and it is given below.

Metals	Supplier A	Supplier B
X	25%	75%
Y	10%	20%

The price of A's scrap is Rs. 200 per quintal and that of B is Rs. 400 per quintal. Use the graphical method to determine the quantities that it should buy from the two suppliers so that the total cost is minimised.

10. Find the optimum solution to the following transportation problem in which the cells contain the transportation costs in rupees.

Warehouses

	W_1	W_2	W_3	W_4	W_5	Available
F_1	7	6	4	5	9	40
F_2	8	5	6	7	8	30
F_3	6	8	9	6	5	20
F_4	5	7	7	8	6	10
Required	30	30	15	20	5	100 (Total)

Factories (for F_1–F_4 rows)

11. (a) Write down the mathematical model of the assignment problem.

(b) A department has five employees with five jobs to be performed. The time (in hours) each man will take to perform each job is given in the effectiveness matrix below.

Employees

Jobs	I	II	III	IV	V
A	10	5	13	15	16
B	3	9	18	13	6
C	10	7	2	2	2
D	7	11	9	7	12
E	7	9	10	4	12

How should the jobs be allocated, one per employee, so as to minimize the total man-hours?

Please Turn Over

12. A manufacturer makes a product, of which the principal ingredient is a chemical X. At the moment, the manufacturer spends Rs. 1,000 per year on supply of X, but there is a possibility that the price may soon increase to four times its present figure because of a worldwide shortage of the chemical. There is another chemical Y, which the manufacturer could use in conjunction with a third chemical, Z, in order to give the same effect as chemical X. Chemicals Y and Z would together cost the manufacturer Rs. 3,000 per year, but their prices are unlikely to rise. What action should the manufacturer take? Apply the maximin and minimax criteria for decision-making and give two sets of solutions. If the coefficient of optimism is 0.4, find the course of action that minimizes the cost.

13. A small project has seven activities. The relevant data about these activities is given below:

Activity	Dependence	Normal Duration (Days)	Crash Duration (Days)	Normal Cost (Rs.)	Crash Cost (Rs.)
A	---	7	5	500	900
B	A	4	2	400	600
C	A	5	5	500	500
D	A	6	4	800	1,000
E	B, C	7	4	700	1,000
F	C, D	5	2	800	1,400
G	E, F	6	4	800	1,600

(i) Draw the network diagram.

(ii) Find out the normal duration and minimum duration.

(iii) What is the percentage increase in cost to complete the project in 21 days?

14. (a) What is a game in game theory? What do you understand by 'zero-sum' in this context?

(b) Define pure strategy and mixed strategy and explain the difference between them.

15. Write short notes on:

(a) Degeneracy in linear programming

(b) Dominance rule in game theory